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GEOLOGIC APPLICATION  
OF THERMAL INERTIA IMAGING  
USING HCMM DATA

8.0 - 10.035  
CR-162446

(E80-10035) GEOLOGIC APPLICATION OF THERMAL  
INERTIA IMAGING USING HCMM DATA Quarterly  
Report, Jul. - Sep. 1979 (Jet Propulsion  
Lab.) 5 p HC A02/MF A01 CSCL 08G

N80-15529

Unclas  
00035  
G3/43

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November 1979  
Quarterly Report for Period July-September 1979

Prepared for:  
Goddard Space Flight Center  
Greenbelt, Maryland 20771

RECEIVED

NOV 21 1979

GIS/902.6

TYPE #

HCMM 028

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. HCM-028	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Geologic Applications of Thermal Inertia Imaging Using HCMM Data		5. Report Date 9 November 1979	
		6. Performing Organization Code	
7. Author(s) Helen N. Paley, Anne B. Kahle and Stuart E.		8. Performing Organization Report No.	
9. Performing Organization Name and Address Marsh Jet Propulsion Laboratory 4800 Oak Grove Drive Pasadena, California 91103		10. Work Unit No.	
		11. Contract or Grant No. NAS 7-100	
12. Sponsoring Agency Name and Address NASA/Goddard Space Flight Center Greenbelt, Maryland 20771 Technical Monitor: James Broderick		13. Type of Report and Period Covered Quarterly Report July-September 1979	
		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract  During the July-September 1979 quarter of the JPL/HCMM Investigation, one set of satellite daytime data tapes was received and processed. Noise and labeling problems on the various images received to date have been identified. Field work with the JPL developed Thermal Inertia Meter has yielded accurate and reproducible measurements of the thermal inertia of various rock and soil types.			
17. Key Words (Selected by Author(s)) HCMM Thermal Inertia Geology		18. Distribution Statement	
19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price*

## Introduction

The JPL/HCOMM Investigation is a study of the feasibility of using thermal inertia, inferred from remotely sensed temperature data, to complement Landsat reflectivity data for reconnaissance geologic mapping and mineral exploration.

During the July-September 1979 quarter of this investigation, one set of HCOMM daytime data tapes was received and processed. The noise problems on these images along with other noise and labeling problems on some of the approximately 100 satellite photographic images received were identified.

Those orbit reference days which cross the JPL test sites were identified from the images and a cataloging procedure for incoming images was developed.

A field measurement program using the Thermal Inertia Meter (TIM) was conducted at the JPL test sites in Western Nevada. The measurements taken of various rock and soil types indicated that the TIM was performing as expected and yielding reproducible and accurate readings of thermal inertia.

## Problems

Approximately 100 photographic images obtained by the HCOMM satellite have been received to date. However, a number of the images were found to be unusable for various reasons. The identifying labels containing location information and date of overpass were found to be incorrect. There were insufficient gray levels on some images. Other images contained severe noise banding. One data set over an area was processed by GSFC twice, at different times. Of the two images produced, one contained the banding, the other did not, indicating that the problem exists in the processing and is not inherent in the satellite data. A "herringbone" pattern over flat areas of middle gray levels was another noise problem found on a few of the images.

One set of satellite daytime data tapes was received. Upon processing by the JPL Image Processing Laboratory the images were found to contain a "checkerboard" noise effect. The JPL processing included logging, pixel

replication for enlargement, and stretching - none of which should cause this effect. The fact that the checkerboards are correlated on the visible and IR images, and that their extent is only a few pixels, suggests a ringing (introduced by cubic resampling) off of a single pixel noise spike.

#### Accomplishments

The JPL test sites were located on the approximately 100 photographic images received to date. The problems discussed above were identified and those images returned to GSFC for their study.

Sufficient HCMM images have been received to establish during which orbit reference days the satellite crosses over the JPL test sites. Also, a system for cataloging and filing all the incoming images has been developed and implemented.

A detailed field measurement program employing the recently developed JPL Thermal Inertia Meter (TIM) was conducted from July 24 through July 31, 1979, in Western Nevada. Approximately forty measurements were taken over a variety of rock and soil types in the Cuprite, Goldfield, and Elko test areas. Sites and materials measured included a clay-silt playa, several alluvial fans, opalized rhyolite ash flow tuff, altered andesite, silicified porphyritic rhyodacite, chert outcrop and soil, barite outcrop and soil, quartz latite, and olivine basalt. Results from this initial effort indicate the device is performing as expected and yielding reproducible and accurate readings of thermal inertia in the field.

#### Significant Results

None

#### Presentations

None

Program for next reporting interval

When sufficient HCMM photographic images have been received, those satellite data tapes with cloud-free coverage of the JPL test sites and obtained at times coincident with field trips to those sites will be ordered for processing. Thermal inertia of target areas will be measured with the TIM at the JPL test sites not visited during this quarter. Analysis of ground-truth data will continue and processing and analysis of HCMM data tapes will begin immediately upon their receipt.

Recommendations

Expedite data distribution.

Funds Expended

Expenditures for July-September, 1979: \$15,512.00

Conclusions

None.